base station **910**, and the angular displacement value (θ) is used to identify the point along this circle where mobile station **920** is located. This calculation may be performed either in base station **910** or the cellular system's switching center. A map matching table (as described above) may also be used to enhance the accuracy of the position determination made by system **900**.

Again, although systems **800** and **900** as described above have been implemented as part of a spread spectrum or CDMA cellular system, it will be understood by those skilled in the art that the steps of these systems may be implemented in connection with other modulation systems such as, for example, time division multiple access modulation systems, in order to determine the position of mobile stations operating within such systems.

Referring now to FIGS. **10** and **10**A, there is shown the operation of a mobile radio positioning system **1000** wherein each cell in the cellular system has an RF channel that is dedicated for positioning uses and unavailable for voice communication, in accordance with a preferred embodiment of the present invention. System **1000** is preferably implemented in connection with a CDMA cellular system in which each cell has a plurality of N (where N is an integer greater two) RF traffic channels, each of which has the capacity to support voice communications between a CDMA base station and a CDMA mobile station. In each cell, one of the N traffic channels is designated as a dedicated positioning channel that is normally unavailable for transmitting telephone voice information signals to mobile stations within the cell. As a result of this designated positioning channel, the CDMA base station associated with each cell in the system will have N-1 normal RF traffic channels that are available to support voice communications between the base station and a CDMA mobile station, and a single RF channel that is a dedicated positioning channel that is unavailable for supporting such voice communications. In the preferred embodiment of the present invention, the dedicated positioning channels are selected for the various cells in the system such that neighboring cells have different RF channels designated as their dedicated positioning channels.

Referring still to FIGS. **10** and **10**A, system **1000** is initially invoked in step **1005** when a mobile station is communicating with a close-by base station (or first base station) on one of the normal RF traffic channels associated with the first base station. When the mobile station is in such communication with the first base station, the first base station performs a round trip time measurement which represents the time it takes for a radio signal to propagate from the first base station to the mobile station and then from the mobile station back to the first base station. This round trip time measurement thus places the mobile station on a circle centered about the first base station.

Next, in step **1010**, the system attempts to perform a timing measurement between the mobile station and a neighboring base station (or second base station). In step **1010**, this measurement is attempted while the mobile station is operating on a normal RF traffic channel associated with the first base station. The timing measurement made in step **1010** may consist of a round trip signal propagation time measurement between the mobile station and the second base station. Alternatively, the timing measurement which is attempted in step **1010** may correspond to the time difference at which the signal from the mobile station is respectively received at the first and second base stations. In the event that the system was able to successful perform such timing measurements in step **1010**, processing proceeds to step **1035**, where the system determines the position of the mobile station based on the timing measurements made in steps **1005** and **1010**. More particularly, the system identifies one or more intersections between the circular line of position determined in step **1005** and the circular (or hyperbolic) line of position determined in step **1010**. If the system finds more than one such intersection, the exact position of the mobile station may be resolved by using a sector antenna at one of the base stations to select the intersection that represents the true position of the mobile station in the cellular system.

If system **1000** was unable to successfully perform any timing measurement in step **1010** because, for example, the mobile radio station was operating at a power level that was below the minimum power required for the second base station to properly receive the mobile station's signal, then processing proceeds to step **1020** where the mobile radio station is switched from a normal RF traffic channel to the dedicated RF positioning channel associated with the first base station. While the mobile station is operating on this dedicated RF positioning channel, the mobile station can clearly receive transmissions from neighboring base stations. In step **1025**, while the mobile station is on the dedicated positioning channel and able to hear such neighboring base stations, the mobile station measures an arrival time difference of signals transmitted from neighboring base stations (or, alternatively, an arrival time difference between a signal transmitted from a neighboring base station and a signal transmitted from the first base station). As described above, this arrival time difference, together with the coordinates of the appropriate base stations, can be used to place the mobile station on a hyperbola between such base stations. In steps **1030**, the mobile station is switched back to a normal RF traffic channel. Finally, in step **1035** (the operation of which is described above), the system determines the position of the mobile station based on the timing measurements made in steps **1005** and **1025**. The position calculations made in step **1035** may be performed either within one or more base stations or within the cellular system's switching center.

Referring now to FIG. **11**, there is shown the operation of a mobile radio positioning system **1100** where a base station transmitter turns itself off during predetermined periods to allow timing measurements to be made between the mobile radio and neighboring base stations, in accordance with a preferred embodiment of the present invention. System **1100** begins at step **1110**, when a first CDMA base station is in normal voice communication with a CDMA mobile station in the coverage area of the first base station. Next, in step **1120**, while the first base station continues to transmit to mobile stations within its coverage area, a mobile station being positioned attempts to locate itself using trilateration, i.e, by attempting to measure signal arrival time differences between the first base station and two other neighboring base stations. Such positioning will be unsuccessful if the mobile station being positioned cannot make the required timing measurements with neighboring base stations. In the event such positioning is unsuccessful, processing proceeds to step **1130**, where the first base station turns off its transmitter for a single vocoder frame. While the first base station's transmitter is silent, the mobile station being positioned measures arrival time differences of signals received from at least three neighboring base stations in step **1140**. In addition, in step **1160**, while the first base station's transmitter is silent, other mobile stations within the coverage area of the first base station mask any transmission errors caused by the temporary interruption of transmissions from the first base